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September 26, 1995

Project No.: 933-6149

United States Environmental Protection Agency
Region II
290 Broadway, 19th Floor
New York, New York 10007

Attn: Mary Anne Rosa

RE: REMEDIAL ACTION REPORT, SOUTH BRUNSWICK LANDFILL

Ladies and Gentlemen:

On behalf of Browning-Ferris Industries of South Jersey (BFISJ), Golder Associates Inc. (Golder Associates) is pleased to present the Remedial Action Report (report) for the South Brunswick Landfill. The report incorporates EPA's comments to a draft report provided at the Site inspection on September 12, 1995 and additional comments to the revised report dated September 18, 1995.

We trust that the information provided is sufficient to meet your requirements and look forward to discussing any comments on the Draft-Final Post-Remedial Environmental Monitoring Report in the near future. If you should have any questions, please do not hesitate to call.

Very truly yours,

GOLDER ASSOCIATES INC.

Robert J. Ines
Senior Project Manager and Associate

RJI/lrl

cc: G. Spradley, BFISJ

437484



REMEDIAL ACTION REPORT

South Brunswick Landfill South Brunswick Township, Middlesex County, New Jersey

INTRODUCTION

The South Brunswick Landfill (Site) is located off of New Road approximately one-half mile northwest of U.S. Route 1 in South Brunswick Township, Middlesex County, New Jersey (see Figure 1). The landfill is approximately 68 acres in size. Lands adjacent to the north, west, and south of the Site are wooded. Residences and businesses exist along New Road north and south of the Site.

The Site is currently owned by Browning-Ferris Industries of South Jersey (BFISJ) through the acquisition of Princeton Disposal Services. The Site had operated for more than 20 years and accepted predominantly municipal refuse which was comingled with hazardous wastes (September 30, 1987, Record of Decision (ROD)). The Site was registered with the New Jersey Department of Environmental Protection (NJDEP) in 1970 and operated until 1978 when it was officially closed on December 31, 1978, pursuant to a closure order from NJDEP.

In June 1980, the United States Environmental Protection Agency (USEPA) conducted an investigation of the Site. The sampling results revealed elevated levels of volatile organic compounds (VOCs) in seven on-Site monitoring wells, as well as five on-Site surface water sampling locations. The Site was placed on the Superfund National Priorities List (NPL) in December 1982, based on the 1980 sampling results. An Administrative Order on Consent (RCRA-700320101) (AOC) was issued by the USEPA on April 5, 1982, to BFISJ. Pursuant to this Order, several environmental investigations were conducted. The results from these investigations, as discussed in the ROD, revealed that leachate from the Site was degrading surface and groundwater quality in the vicinity of the Site. Although the Site posed no immediate threat to potable water supplies, there was a concern about potential future impacts on regional groundwater quality. The USEPA, therefore,

determined it was necessary to implement a remedial action which would effectively contain the buried waste mass at the Site and mitigate any future potential release of contaminants from the Site. The environmental studies conducted at the Site were utilized to develop a Remedial Action Plan for the Site. The Remedial Action was initiated in May 1983 and was completed in May 1985.

Final Remedy

The Remedial Action consisted of a Site-wide containment remedy consisting of the following elements:

1. Multi-Layered Cap and Grading
2. Slurry Wall
3. Leachate Collection System
4. Gas Venting System

The Remedial Action was completed in May 1985 and the location of the remedial elements are shown on Figure 1. Subsequently, the ROD was issued on September 30, 1987. The ROD documented the selected remedy was in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), and to the extent practicable, the National Contingency Plan (NCP). The ROD declared the selected remedy is protective of human health and the environment, attaining Federal action and location specific requirements that are applicable or relevant and appropriate and cost-effective. The remedy was selected on the basis of its implementability and proven effectiveness in landfill containment given the hydrogeology of the Site, size of the landfill and waste disposal practices. Excavation and off-site disposal and/or treatment of hazardous waste was not considered feasible or cost-effective due to the size of the landfill and the fact that discrete areas of hazardous waste disposal could not be adequately identified. The ROD also recommended the addition of a Site security fence. The Site security fence was subsequently installed in June 1990.

In addition to the remedial actions described above, an on-site leachate pre-treatment plant has been constructed and upgrades have been made to the surface water drainage system. Upgrades were made to the surface water drainage system in 1991 in compliance with the Freehold Soil Conservation District. The upgrades consisted of grading in the central area of the Site; construction of five surface water drainage channels; improvements to five existing culverts and the installation of an energy dissipator; and revegetation.

The on-site leachate pre-treatment plant was constructed in 1993. Prior to construction of the plant, leachate was discharged directly to the sanitary sewer line for final treatment by the Stoney Brook Regional Sewerage Authority. The on-site plant was constructed pursuant to an Administrative Consent Order (ACO) entered between BFISJ and NJDEP which required the iron concentrations in the effluent to be reduced.

The Site strategy of the remedy is on-site containment and monitoring for a period of 30 years. A Post-Remedial Environmental Monitoring Work Plan (PREMWP), as required by the ROD, to assess the effectiveness of the completed Remedial Action and evaluate pre-remedial off-site migration of contaminants, was submitted to the USEPA on June 5, 1987; and, pursuant to USEPA's unilateral Administrative Order No.II-CERCLA-90104 issued on March 6, 1989, a revised PREMWP was submitted on May 7, 1993. The PREMWP was approved by the USEPA on May 11, 1993. The Post-Remedial Environmental Monitoring program was initiated on May 17, 1993, and completed in January 1994. A Post-Remedial Environmental Monitoring Draft-Final Report was submitted to the USEPA on March 2, 1994 summarizing the results of the investigation. The results from this investigation document the performance of the remedy and further indicate there are no significant migration of Site related contaminants with the exception of the monitoring well R-10 area. However, constituents detected in well R-10 are expected to be controlled through proper operation of the leachate collection system to induce inward gradients. Continued monitoring of groundwater quality in monitoring well R-10 and downgradient surface water quality will document the effectiveness of these measures. The operation and maintenance plan, including remedy monitoring requirements, will be incorporated in the Final Post-Remedial Environmental Monitoring

Report. Based on the Operation and Maintenance Plan monitoring results, additional leachate collection system adjustments and/or further remedial action may be required.

CHRONOLOGY OF EVENTS

<u>Date</u>	<u>Event</u>
April 5, 1982	Administrative Order on Consent (RCRA-700320101)
May 1983	Remedial Action initiated
May 1985	Remedial Action completed
June 5, 1987	Post-Remedial Environmental Monitoring Work Plan submitted to USEPA
September 30, 1987	Record of Decision signed by the Regional Administrator
March 6, 1989	Unilateral Administrative Order No. II - CERCLA-90104
June 1990	Installation of Site security fence
August 12, 1991	Soil erosion and sedimentation control upgrades initiated
November 8, 1991	Soil erosion and sedimentation control upgrades completed
February 1993	Pre-treatment plant construction completed
May 7, 1993	Revised Post-Remedial Environmental Monitoring Work Plan submitted to USEPA
May 11, 1993	Post-Remedial Environmental Monitoring Work Plan approved by the USEPA
May 17, 1993	Initiated the Post-Remedial Environmental Monitoring Work Plan
March 2, 1994	Post-Remedial Environmental Monitoring Draft-Final Report submitted to USEPA
September 12, 1995	USEPA inspection of the completed Remedial Action.

PERFORMANCE STANDARDS AND CONSTRUCTION QUALITY CONTROL

The major elements associated with the selected and implemented Remedial Action included the construction of a multi-layered cap and Site grading; a slurry wall (cut-off wall); a leachate collection system; a gas venting system; and, in accordance with the recommendation in the ROD, a Site security fence. These containment measures were developed to control the potential release of hazardous substances from the Site.

The following is a description of the elements associated with the selected Remedial Action:

Multi-Layered Cap and Site Grading

A multi-layered cap (cap) was constructed over the entire Site. The cap consists of a 12-inch layer of compacted clay with a maximum permeability of 1.0×10^{-7} cm/sec overlain by a 6-inch sand drainage layer and a 6-inch vegetated soil layer. The cap functions to reduce infiltration of precipitation, promote surface water drainage and prevent direct contact with waste materials.

Slurry Wall

A slurry wall 7000 feet long and 3-feet wide was constructed circumscribing the bulk of the waste mass. The constructed alignment was chosen based on the presence of competent bedrock or saprolite (residual soil) in which the cut-off wall was keyed. Construction of the cut-off wall was of the slurry trench clay type. The wall was designed and constructed to achieve a permeability of 1.0×10^{-7} cm/sec and the slurry consists of a shale/silty sand mixture with 1% bentonite. The cut-off wall serves to effectively contain and isolate the waste mass from the surrounding shallow groundwater system.

Leachate Collection System

The perimeter leachate collection system is located on the inward (landfill) side of the cut-off wall. The leachate is pre-treated on-site for iron prior to discharge to the sanitary sewer line for final treatment by the Stoney Brook Regional Sewerage Authority. In

addition to the perimeter collection system, there is an interior shallow collection system consisting of a collection line and a french drain which tie into the perimeter system. A second french drain connected to the perimeter leachate collection system was constructed to collect leachate generated in the northern area of the Site which is not circumscribed by the cut-off wall. The leachate collection system functions to control potential off-Site leachate migration, reduce leachate levels within the landfill to induce inward gradients across the cut-off wall, and to convey leachate to the on-site pre-treatment facility.

Gas Venting System

The gas venting system consists of three interior passive vents. The gas system controls the potential subsurface migration of landfill gas generated by the decomposition of waste. The gas vents are permitted by the NJDEP Air Pollution Control Program (APC) under a Certificate to Operate Control Apparatus or Equipment (Certificate #092236).

Site Security Fence

A 6-foot galvanized chain-link security fence with 3-strand barbed wire circumscribes the Site. A main gate is located in the southeastern corner of the Site providing access from New Road. Various locking man-gates are located around the Site. The Site security fence was modified in 1994 to circumscribe some of the groundwater monitoring wells installed as part of the Post-Remedial Environmental Monitoring Program. The purpose of the security fence is to prevent unauthorized access to the Site.

The following documents were submitted to the USEPA which certify the construction of the Final Remedy in accordance with the USEPA and NJDEP approved Remedial Action Plan:

- Certification Report for the Slurry Trench Cut-Off Wall Construction, South Brunswick Township Landfill - Remedial Action Plan prepared by Wehran Engineering, June 1984;
- South Brunswick Landfill Cover Certification, South Brunswick, New Jersey prepared by Woodward-Clyde Consultants, July 26, 1985; and,

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- Leachate Collection System Construction Report prepared by Browning-Ferris Industries, May 1986.

These reports may be referred to for details related to the construction of the Remedial Action including quality control reports.

CONSTRUCTION ACTIVITIES

A summary of the construction activities associated with each element of the Remedial Action are described below.

Multi-Layer Cap and Site Grading

Woodward-Clyde Consultants (WCC) provided field inspection of the multi-layer cap (cap) construction beginning on June 5, 1984. The construction was completed on July 11, 1985 and was completed in general accordance with the provisions of the closure plan (WCC, July 1985).

The cap consists of a 12-inch layer of compacted clay with a maximum permeability of 1.0×10^{-7} cm/sec overlain by a 6-inch sand drainage layer and a 6-inch vegetated soil layer. The placement of the clay cover was completed over the entire Site with the exception of the access road and the Site entrance on New Road. The sand cover and vegetated soil layer was placed over the entire Site, with the exception of the access road. A geosynthetic netting was placed over the entire length of the central swale as an erosion protection measure.

Additional Site activities related to maintaining and improving the selected and implemented remedy have included renovation of the Site drainage system. The cap and drainage controls were designed, in part, to facilitate surface run-off. Primarily due to settlement, renovation of the Site drainage system was later completed at the Site in accordance with an approved plan dated May 1991 (revised June 1991) entitled "Soil Erosion and Sedimentation Control Plan" prepared by Earth Sciences Consultants, Inc. (Earth Sciences). Activities commenced on August 12, 1991 and completed on November

8, 1991. All construction activities were performed by B&J Warren & Sons. Renovation was completed on each of the following items:

- Erosion control barriers
- Stabilized construction entrance
- Surface grading
- Drainage channel construction
- Drainage Culverts A through E, Energy Dissipation A through C, and the scour pit
- Site revegetation

All work was completed in accordance with the approved plan and the New Jersey Soil Conservation Services (Earth Sciences, February 1992) and certified by the Freehold Soil Conservation District.

Slurry Wall

The construction of the slurry wall began on September 21, 1983 with D'Appolinia Waste Management Services as the contractor. BFI provided construction management for the Site, and Wehran Engineering provided construction observation/quality assurance for the slurry wall. The slurry wall was completed in December 1983 and constructed in general conformance to the approved design (WEC, June 1984).

The slurry wall was extended to either bedrock or saprolite. Where the slurry wall was keyed in bedrock, the key-in point was determined by refusal of the backhoe along with interpretation of the available geologic data. Where key-in was to the residual soil, the key-in point was determined by inspecting the soils removed from the trench. Once clayey residual soil of the diabase was identified, the key was extended a minimum of 2 feet into the residual soil. The majority of the cut-off wall alignment (approximately 63%) is keyed into bedrock and the remaining length is keyed into saprolite.

The design requirement for the backfill was that it achieve a maximum in-place permeability of 1.0×10^{-7} cm/sec. D'Appolonia performed testing on trial samples of soil types which would achieve the requisite permeability. Two samples of mixtures of shale and silty sand with one percent bentonite added, when tested had permeability values less than 1.0×10^{-7} cm/sec. These test results were used as a guide in evaluating backfill placed. In addition, permeability testing of "undisturbed" Shelby tube samples taken at intervals of approximately 300 feet along the wall, were used as confirmation of field indicator test results. Six of these permeability tests were performed with leachate as the permeant to assess the impact, if any, of exposure of the backfill to the landfill leachate. All samples tested exhibited permeabilities of less than 1.0×10^{-7} cm/sec and were generally on the order of 5×10^{-8} cm/sec.

In addition, a testing program was performed during the cut-off wall construction for control of the slurry properties.

Leachate Collection

The construction and construction management of the leachate collection and gas venting system was performed by BFI under the supervision of a full-time resident engineer/manager. During construction, the Site was frequently inspected by USEPA, NJDEP, and South Brunswick Township Health Department personnel.

The leachate collection system was completed in June 1984 and constructed in general conformance to the approved design drawings (BFI, May 1986).

The leachate collection system was generally constructed to circumscribe the Site and on the inward (landfill) side of the cut-off wall. The collection system was constructed in a 3-foot wide trench and consists of a 6-inch diameter perforated corrugated polyethylene pipe in coarse stone backfill. The stone and pipe are enclosed in a filter fabric envelope to minimize clogging of the system. Concrete manholes with vent risers are located approximately at 500-foot intervals along the collection line for monitoring of the leachate

level and inspection of the system. Leachate is conveyed by gravity to two pump stations. The leachate is then pumped via a 3-inch PVC force main to a metering station located in a leachate pre-treatment plant where it is pre-treated for iron prior to discharge to the sanitary sewer line for final treatment by the Stoney Brook Regional Sewerage Authority. In addition to the perimeter collection system, there is an interior shallow collection system consisting of a collection line and a french drain which tie into the perimeter system. The collection line is located in the low lying area west of the drainage swale in the central area of the Site and the french drain is located to the east of the drainage swale in the central area of the Site. A second french drain connected to the perimeter leachate collection system was constructed to collect leachate from areas not circumscribed by the cut-off wall.

Gas Venting System

The gas collection system consists of three interior passive vents. The passive vents were constructed of 10-inch aluminum vent risers with shallow collection pipes radiating from each riser. A security fence is located around each vent riser. The interior gas vents are permitted by the NJDEP Air Pollution Control (APC) program under a Certificate to Operate Control Apparatus or Equipment (Certificate #092236).

Site Security Fence

The Site security fence construction began in January 1990 and was completed in June 1990. The construction was performed by Consolidated Steel and Aluminum Fence Company. The Site security fence which circumscribes the entire Site is 6 feet galvanized chain-link fence with 3-strand barbed wire with several man gates and one double swing Site entrance gate.

Pre-Treatment Plant

The construction of the pre-treatment plant began in March 1992, with Hydro-Group, Inc. as the contractor and was completed in February 1993. The pre-treatment plant was constructed in general conformance to the approved design (Hydro-Group, Inc., March 1993).

Refuse was encountered during excavation for the pre-treatment plant on July 13, 1992. A cap disruption Work Plan was submitted and approved for placement of the refuse on-site. Cap disruption activities began on November 30, 1992 and were completed December 10, 1992.

The pre-treatment plant was designed and constructed to reduce iron concentrations in the effluent from the leachate collection system prior to discharging to the Stoney Brook Regional Sewerage Authority. The treatment train consists of raising the pH with potassium hydroxide, followed by aeration using an induced draft aerator with subsequent addition of potassium permanganate, and clarification using lamella-type plate clarifier. The facility is fully automated and designed to shut down in the event of any equipment failure or abnormal operating conditions. An alarm panel will transmit alarm messages to the designated operator(s). The treatment plant is permitted by the NJDEP (Treatment Works Approval Permit #91-5754-42).

FINAL INSPECTION

A final inspection was performed on September 12, 1995. In attendance at the final inspection were Pat Evangelista and Mary Anne Rosa of the USEPA, Gordon Spradley of BFISJ, and Bob Illes of Golder Associates. No deficient construction items were identified during the final inspection.

CERTIFICATION THAT REMEDY IS OPERATIONAL AND FUNCTIONAL

The Remedial Action, consisting of a site-wide containment remedy, has been implemented; and, subsequently operated and maintained by BFISJ. The multi-layered cap has effectively reduced infiltration as indicated by the significant reduction in the amount of leachate generation. The leachate collection system and cut-off wall have reduced leachate levels within the landfill, resulting in inward hydraulic gradients over much of the Site and pre-treated leachate is conveyed to the Stoney Brook Regional Sewerage Authority in accordance with BFISJ's discharge permit. In addition, the gas venting system is operating in accordance with the existing APC permit and a series of perimeter gas monitoring probes are periodically monitored voluntarily by BFISJ.

The results of the various media investigated during the Post-Remedial Environmental Monitoring Program, document the performance of the remedy and further indicate there are no significant migration of Site related contaminants with the exception of groundwater in the monitoring well R-10 area. However, groundwater constituents detected in the well are expected to be controlled through proper operation of the leachate collection system to induce inward gradients. Continued monitoring of groundwater quality in monitoring well R-10 and downgradient surface water quality will assure the effectiveness of these measures.

OPERATION AND MAINTENANCE

The operation and maintenance of the remedy will be incorporated in the Final Post-Remedial Environmental Monitoring Report which will provide for periodic inspection, maintenance, and monitoring to evaluate and maintain the effectiveness of the existing Remedial Action.

SUMMARY OF PROJECT COSTS

The selected remedial action has been implemented at a cost of \$8.6 million, which has included:

- multi-layered cap and grading;
- slurry wall;
- leachate collection systems; and,
- gas venting system.

In addition, BFISJ has expended \$4.5 million for post-ROD remedial activities which has included:

- leachate pre-treatment plant;
- soil erosion and sedimentation upgrade;
- implementation of post-remedial environmental monitoring plan; and,
- installation of gas probes.

Total remedial expenditures have totaled \$13.1 million.



LEGEND

SS-01SOIL SAMPLE LOCATION

SD-01SEDIMENT SAMPLE LOCATION

SW-01SURFACE WATER LOCATION

R-1GROUNDWATER MONITORING WELL (OVERBURDEN) INSTALLED BY GOLDER ASSOCIATES (1993)

B-1GROUNDWATER MONITORING WELL (BEDROCK) INSTALLED BY GOLDER ASSOCIATES (1993)

MH-01MANHOLE LOCATION

PUMP STATION LOCATION

GAS VENT

CULVERT

MARSH

LIMIT OF PROPERTY BOUNDARY AND RIGHT OF WAY

10 FT. CONTOUR LINE (FT-MSL)

2 FT. CONTOUR LINE (FT-MSL)

DRAINAGE CHANNEL

STREAM

EDGE OF WOODS

SLURRY WALL

LEACHATE COLLECTION LINE

- REFERENCES**
- 1.) SLURRY WALL AND LEACHATE COLLECTION LINE LOCATIONS ARE APPROXIMATE AND HAVE BEEN DIGITIZED FROM "AS BUILT PLAN VIEW", PREPARED BY BROWNING-FERRIS INDUSTRIES, DATED NOVEMBER 13, 1986.
- 2.) GAS VENT LOCATIONS ARE APPROXIMATE AND HAVE BEEN DIGITIZED FROM FIGURE 2, "POST CLOSURE MONITORING LOCATIONS, SOUTH BRUNSWICK LANDFILL", BY ENGINEERING TECHNOLOGIES ASSOCIATES, INC. DATED JULY 28, 1988.
- 3.) TOPOGRAPHIC BASE MAP IS APPROXIMATE AND HAS BEEN DIGITIZED FROM FIGURE 2 "POST-CLOSURE MONITORING LOCATIONS, SOUTH BRUNSWICK LANDFILL", BY ENGINEERING TECHNOLOGIES ASSOCIATES, INC. DATED JULY 28, 1988. UPDATES TO THE TOPOGRAPHY WERE DIGITIZED BASED ON FIGURE 1, "AS RECORDED SITE PLAN SOUTH BRUNSWICK LANDFILL", BY EARTH SCIENCES CONSULTANTS, INC. DATED FEBRUARY 18, 1992. OFF-SITE TOPOGRAPHY DIGITIZED FROM THE USGS TOPOGRAPHIC MAP, MONMOUTH JUNCTION, NEW JERSEY, QUADRANGLE DATED 1981. MODIFICATIONS TO THE TOPOGRAPHIC LINES AND FEATURES WERE REQUIRED TO TIE IN THE SEPARATE MAPS.
- 4.) STREAM AND MARSH AREA TO THE SOUTH OF THE SITE BASED ON OBSERVATIONS MADE DURING SURFACE WATER AND SEDIMENT SAMPLING (MAY AND OCTOBER 1983).
- 5.) PROPERTY BOUNDARY AND RIGHT OF WAY LIMITS ARE APPROXIMATE AND HAVE BEEN DIGITIZED FROM "SURVEY OF PROPERTY OF BROWNING-FERRIS INDUSTRIES", BY NASSAU SURVEYING, DATED JULY 5, 1988.
- 6.) MANHOLE DESIGNATIONS BASED ON FIELD LABELS ON RISER VENTS.
- 7.) MANHOLES, MONITORING WELLS AND SAMPLING POINTS SURVEYED BY GILMORE AND ASSOCIATES, INC.

2000200400
scalefeet

REV	DATE	DESCRIPTION	DR BY	CHK BY	RVW BY
1	02/21/94	ADDED SURFACE WATER LOCATIONS SW-03 THRU SW-06	JSC		

BROWNING-FERRIS INDUSTRIES OF SOUTH JERSEY, INC.
SOUTH BRUNSWICK LANDFILL
SOUTH BRUNSWICK, NEW JERSEY

SHEET TITLE:
LOCATION PLAN

Golder Associates
Mt. Laurel, New Jersey

PROJECT No.	933-6149	FILE No.	1NJ02-481	
CLIENT PROJ. No.		DRAFTING SUBTITLE	01	
DES BY	RJI	09/01/93	SCALE:	AS SHOWN
DR BY	MRW	09/25/93		
CHK BY	SDM	09/30/93		
RVW BY	WBL	09/30/93		

FIGURE 2